

1. How many micrograms (expressed in scientific notation and with appropriate number of significant figures) are there in 3.00 grams?
- (a)  $3.00 \times 10^{-6} \mu\text{g}$
  - (b)  $3.00 \times 10^{-5} \mu\text{g}$
  - (c)  $3.0 \times 10^6 \mu\text{g}$
  - (d)  $3.00 \times 10^6 \mu\text{g}$
2. The formula for nitrate ion is:
- (a)  $\text{NO}_3$
  - (b)  $\text{NO}_3^{2-}$
  - (c)  $\text{NO}_3^-$
  - (d)  $\text{HNO}_3^-$
3. Workplace walk-through surveys generally include a study of:
- (a) Processes, operations and related activities
  - (b) Equipment
  - (c) Properties of substances used and produced
  - (d) All of the answers apply
4. Hardness of water is due to the presence of certain:
- (a) Alkali metal cations
  - (b) Transition metal cations
  - (c) Rare gases
  - (d) None of the answers apply [Alkali Earth]
5. After performing a calculation, Leo's calculator displayed the result as 14.5977. If the answer can have only three significant figures and must be expressed using scientific notation, it should be reported as:
- (a)  $1.46 \times 10^0$
  - (b)  $1.46 \times 10^2$
  - (c)  $1.46 \times 10$
  - (d) 146/10
6. The formation of sulfuric acid in the atmosphere is due to the reactions of:
- (a) Oxides of sulfur
  - (b) Oxides of phosphorus
  - (c) Oxides of carbon
  - (d) All of the answers apply

7. The concentration of air contaminants is determined by:
- (a) Exposing humans to the contaminants
  - (b) Exposing animals to the contaminants
  - (c) Exposing bacteria to the contaminants
  - (d) None of the answers apply
8. The number of hydrogen atoms in a cyclohexane ring is:
- (a) 6 ~~x~~
  - (b) 9
  - (c) 12 ✓
  - (d) None of the answers apply
- C<sub>6</sub>H<sub>12</sub>*
9. Chemotherapy involves treatment of cancer using:
- (a) Hypnotherapy
  - (b) Acupuncture
  - (c) Alkylating agents
  - (d) All of the answers apply
10. An atom with 35 protons and 45 neutrons represents an atom of:
- (a) Br
  - (b) Ne
  - (c) Re
  - (d) Rh
11. Surfactants are effective in:
- (a) Decreasing the surface tension of water
  - (b) Increasing the surface tension of water
  - (c) Increasing the polarity of water
  - (d) None of the answers apply
12. Ground-level O<sub>3</sub> is produced during photochemical reactions between:
- (a) VOCs and O<sub>2</sub>
  - (b) H<sub>2</sub>O and O<sub>2</sub>
  - (c) VOCs and N<sub>2</sub> in the presence of O<sub>2</sub>
  - (d) None of the answers apply
13. A concentration of  $2.10 \times 10$  ppb for a gas in air is equal to:
- (a)  $2.10 \times 10^2$  ppm
  - (b)  $2.10 \times 10^{-5}$  %
  - (c)  $2.10 \times 10^{-6}$  %
  - (d) None of the answers apply

14. A water sample shows a pH of 5.7. The sample is:  
(a) Acidic  
(b) Neutral  
(c) Basic  
(d) None of the answers apply
15. If the density of a substance is 3.36 g/mL, what is the volume of 30.92 g of this substance?  
(a) 9.202 g  
(b) 25.97 mL  
(c)  $9.20 \times 10^{-3}$  L  
(d)  $1.09 \times 10^{-2}$  mL
16. One of the gases responsible for global warming is:  
(a) CO  
(b) O<sub>2</sub>  
(c) N<sub>2</sub>O  
(d) None of the answers apply
17. Which of the following statements is false?  
(a) Noise is a form of irregular vibration  
(b) Microwaves do not penetrate appreciably below the skin  
(c) X-Rays are damaging to body tissue  
(d) Radiation can be detected by human senses
18. A cation M<sup>2+</sup> contains 54 electrons. The number of protons in the neutral atom (from which the cation is formed) is given by:  
(a) 54  
(b) 2  
(c) 56  
(d) 110
19. Which of the following is a viral infection?  
(a) AIDS  
(b) Depression  
(c) Reye syndrome  
(d) None of the answers apply
20. Detergents almost eliminate the scum formation because they are:  
(a) More expensive than soaps  
(b) Less affected by ions causing water hardness  
(c) Naturally occurring materials  
(d) Used only with water free of Mg<sup>2+</sup> and Ca<sup>2+</sup> ions

21. Weakly acidic nature of rain is due to dissolved:
- (a)  $O_3$
  - (b)  $NH_3$
  - (c)  $CO$
  - (d) None of the answers apply
22. The compound with the formula  $CH_3(CH_2)_2OCOCH_3$  contains:
- (a) One functional group
  - (b) Five carbon atoms and ten hydrogen atoms
  - (c) Two oxygen atom
  - (d) All of the answers apply
23. A mountain climber at an altitude of 6000 meters may be subjected to pressure conditions described as:
- (a) Atmospheric
  - (b) Hyperbaric
  - (c) Hypobaric
  - (d) None of the answers apply
24. In the cleaning process the polar end of the surfactant is attracted to water because water is:
- (a) Dirty
  - (b) Polar
  - (c) Hot
  - (d) None of the answers apply
25. Extremely fine particles of zinc oxide formed during welding (a high temperature process) are an example of:
- (a) Vapor
  - (b) Fume
  - (c) Smoke
  - (d) Mist
26. Which of the following gas (or vapor) interferes with the oxygen transport by hemoglobin?
- (a)  $H_2O$
  - (b)  $O_2$
  - (c)  $CO$
  - (d) None of the answers apply

27. Sulfur dioxide has the formula:  
(a)  $\text{SO}_3$   
(b)  $\text{S}_2\text{O}_4$   
(c)  $\text{S}_2\text{O}$   
(d)  $\text{SO}_2$
28. The reaction of limestone with sulfuric acid generates gaseous:  
(a) Sulfur dioxide  
(b) Carbon monoxide  
(c) Sulfur trioxide  
(d) None of the answers apply
29. The nature of O-H bonds in water is  
(a) Ionic  
(b) Covalent  
(c) Nonionic  
(d) None of the answers apply
30. In the balanced equation for the reaction between gaseous nitrogen and hydrogen gas, forming gaseous ammonia, the coefficient for hydrogen gas is:  
(a) 4  
(b) 1  
(c) 2  
(d) 3
- $$1\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$$
31. Chemical hazards may arise in operations involving:  
(a) Oxidizing materials  
(b) Corrosive materials  
(c) Flammable and combustible materials  
(d) All of the answers apply
32. The mere presence of a causative agent constitutes a hazard. It is classified as hazardous in all circumstances.  
(a) True  
(b) False
33. Hazard posed by exposure to excessive vibration is classified as:  
(a) Chemical  
(b) Biological  
(c) Physical  
(d) None of the answers apply

34. Reye syndrome is a possible side effect due to the consumption of:
- (a) Trans fats
  - (b) Excess salt
  - (c) Ice cream
  - (d) None of the answers apply
35. The depletion of stratospheric ozone is caused by:
- (a) Water vapor
  - (b) Nitric oxide
  - (c) CFCs
  - (d) All of the answers apply
36. The sulfide ion contains:
- (a) 16 protons and 16 electrons
  - (b) 16 protons and 14 electrons
  - (c) 14 protons and 16 electrons
  - (d) 16 protons and 18 electrons
37. Sunscreen products contain chemicals to absorb:
- (a) Microwaves
  - (b) Vibration
  - (c) Infrared radiation
  - (d) Ultraviolet Radiation
38. What is the mass of one mole of carbon atoms?
- (a)  $6.022 \times 10^{23}$  g
  - (b) 12.01 g
  - (c) 24.02 g
  - (d) 6.02 g
39. Commonly used antidepressants include:
- (a) MAOIs
  - (b) Tricyclics
  - (c) Serotonin and Norepinephrine Reuptake Inhibitors
  - (d) All of the answers apply
40. Curling of hair involves:
- (a) Treating hair with a reducing agent
  - (b) Setting hair in the desired shape
  - (c) Treating hair with an oxidizing agent
  - (d) All of the answers apply

41. One of the suggested ways to control global warming is to:
- (a) Increase CO<sub>2</sub> emissions
  - (b) Use more fossil fuels
  - (c) Destroy CO<sub>2</sub> sinks
  - (d) Conserve energy
42. Ozone containing layer of the atmosphere is called:
- (a) Ozonosphere
  - (b) Geosphere
  - (c) Stratosphere
  - (d) None of the answers apply
43. In hair coloring the oxidation of natural hair pigments to colorless products is achieved by using a:
- (a) Dye
  - (b) Reducing agent
  - (c) Coloring agent
  - (d) None of the answers apply
44. In the hormone therapy for the treatment of cancer, the chemotherapeutic agent acts by decreasing the hormone supply.
- (a) True
  - (b) False
45. The solubility of lead at a pH of 7.0 is lower than at a pH of 3.2.
- (a) True
  - (b) False
46. The abbreviation IRPTC stands for:
- (a) Informal Register of Potentially Toxic Chemicals
  - (b) International Register of Potentially Toxic Chemicals
  - (c) International Register of Patented Toxic Compounds
  - (d) None of the answers apply
47. Long chain and cyclic structures are common for organic compounds because carbon can form:
- (a) Ionic bonds with other carbon atoms
  - (b) Covalent bonds with other carbon atoms
  - (c) No bonds with other carbon atoms
  - (d) None of the answers apply


48. Major components of air include:
- (a)  $\text{NO}_x$
  - (b)  $\text{SO}_x$
  - (c)  $\text{O}_3$
  - (d) None of the answers apply
49. You are driving on a highway with a posted speed limit of 100 km/hr. Your speedometer indicates a speed of 95 miles/hr. If 1 km = 0.62 mile, are you driving:
- (a) Below the speed limit
  - (b) Above the speed limit
  - (c) At the posted limit
  - (d) None of the answers apply
50. The unit used to express concentration of particles in the air is:
- (a)  $\text{mg}/\text{m}^3$
  - (b)  $\text{mg}/\text{g}$
  - (c)  $\text{cm}^3/\text{m}^3$
  - (d) None of the answers apply
51. One mole of magnesium atoms contains:
- (a) 1 atom of magnesium
  - (b)  $6.022 \times 10^{23}$  atoms of magnesium
  - (c)  $6.022 \times 10^{-23}$  atoms of Mg
  - (d) 1 g of magnesium
52. A neutral atom contains 13 protons and has a mass number of 27. The number of electrons in the atom is:
- (a) 40
  - (b) 14
  - (c) 27
  - (d) 13
53. A three-drug cocktail in the treatment of AIDS consists of:
- (a) Penicillins
  - (b) Cephalosporins
  - (c) Tetracyclines
  - (d) Different nucleoside derivatives and a protease inhibitor
54. A balanced chemical equation complies with the Law of Conservation of Mass and Matter.
- (a) True
  - (b) False

55. Health professionals strongly recommend that medications may have serious interactions with:
- (a) Other medications taken
  - (b) Dietary supplements taken
  - (c) Food and beverages consumed
  - (d) All of the answers apply
56. In the implementation of WHMIS, suppliers must provide hazard information through:
- (a) Telephone calls
  - (b) e-Mails
  - (c) MSDSs only
  - (d) Labels and MSDSs
57. Plant debris rest on the surface of water bodies due to:
- (a) Low surface tension of water
  - (b) No surface tension of water
  - (c) High surface tension of water
  - (d) None of the answers apply
58. Adverse effects of acid rain on the aquatic life are due to:
- (a) Decrease in pH
  - (b) Decrease in aqueous concentrations of  $Al$
  - (c) Decrease in aqueous concentrations of Pb
  - (d) None of the answers apply
59. It has been established that ergonomics, properly applied, can help improve productivity and quality of work.
- (a) True
  - (b) False
60. Skin moisturizers perform a number of functions such as:
- (a) Prevent and treat dry skin
  - (b) Improve skin tone and texture
  - (c) Mask skin imperfections
  - (d) All of the answers apply
61. Some newer methods for drug delivery include:
- (a) Pulmonary delivery
  - (b) Skin absorption
  - (c) Nanocrystals
  - (d) All of the answers apply

62. Toxicants affecting the liver are called:  
(a) Neurotoxins  
(b) Hepatotoxins  
(c) Nephrotoxins  
(d) None of the answers apply
63. Which of the following statements is false?  
(a) Ice has a hexagonal open structure  
(b) Hydrogen bonds in water are stronger than covalent bonds  
(c) Ice floats on water  
(d) High heat of vaporization of water helps in regulating the temperature of our body
64. Antibiotics are used to treat AIDS.  
(a) True  
(b) False
65. One of the influencing factors in making the chemistry of Personal Care Products an expanding and dynamic field is:  
(a) Lower price  
(b) Aging population  
(c) Better packaging of these products  
(d) Bulk production
66. Which of the following statements is true based upon the information that the TLVs for two chemicals X and Y are 5.0 ppm and  $4.5 \times 10^3$  ppb respectively?  
(a) X poses more risk than Y  
(b) Y poses less risk than X  
(c) X and Y pose the similar risk  
(d) Y poses more risk than X  
 $Y = 4.5 \text{ ppm} < X$
67. Solar energy is an example of a:  
(a) Fossil energy source  
(b) Non-fossil energy source  
(c) No energy source  
(d) Nuclear energy source
68. A worker is repeatedly exposed to a concentration of  $9.5 \times 10^3$  ppb of a substance. If the TLV-TWA for the substance is 2.5 ppm, it is a safe work environment for the worker.  
(a) True  
(b) False  
 $9.5 \text{ ppm} > 2.5 \text{ ppm}$

69. The impact of household cleaners on the environment is minimized because these products are formulated:
- (a) To work with water and end up in wastewater treatment plants
  - (b) Free of chemicals
  - (c) With natural ingredients only
  - (d) To change into environmentally friendly ingredients immediately after use
70. How many moles of glucose are there in  $3.60 \times 10^8 \mu\text{g}$  of glucose? [Molar mass of glucose = 180 g/mol]
- (a)  $2.00 \times 10^0$  moles
  - (b)  $2.00 \times 10^6$  moles
  - (c)  $6.48 \times 10^{10}$  moles
  - (d) None of the answers apply
71. Which of the following statements is true?
- (a) The atomic number of an element is equal to the number of neutrons in the nucleus of its atoms
  - (b) The nucleus of the atom contains electrons
  - (c) Ions are charged species formed by loss or gain of electron(s) from an atom
  - (d) Density is a chemical property of a substance
72. Which of the following statements is false?
- (a) The atmosphere is a layered structure
  - (b) Microbial activity of soil bacteria emits oxides of nitrogen
  - (c) Water molecule contains two ionic bonds
  - (d) Nitrogen is a major component of the air we breathe
73. Lipstick and mascara are examples of:
- (a) Cosmeceuticals
  - (b) Sunscreens
  - (c) Facial cosmetics
  - (d) Pharmaceuticals
74. The correct name for  $\text{CH}_4$  is:
- (a) Carbon tetrahydride
  - (b) Carbon(IV) hydride
  - (c) Methane
  - (d) None of the answers apply

75. Which of the following statements is true for acute toxicity?  
 (a) Results from brief exposure to high concentrations of the contaminant  
(b) Responses generally have latency periods  
(c) Responses are difficult to observe and relate  
(d) Results from low and repeated exposure over a long period of time
76. When Botox is used in providing more youthful look, it is classified as:  
(a) An OTC drug  
 (b) A cosmeceutical  
(c) An anti-inflammatory drug  
(d) An antiviral drug
77. If under a set of optimum conditions, 2.00 moles of gaseous ozone are produced from 3.00 moles of oxygen gas, how many moles of gaseous ozone will be produced (under similar conditions) from 22.5 moles of oxygen gas?  
 (a) 15.0 moles  
(b) 45.0 moles  
(c) 33.8 moles  
(d) 22.5 moles
78. A functional group can be visualized as the chemically functioning part of the molecule.  
 (a) True  
(b) False
79. Which of the following statements is false?  
(a) CFCs have high stability and long lifetime  
(b) Stratospheric ozone depletion will lead to increased intensity of ground-level UV radiation  
(c) Increased intensity of UV radiation may accelerate degradation of rubber  
 (d) Montreal protocol was signed to increase the manufacture and use of CFCs and other ozone depleting substances
80. Which of the following statements is true?  
(a) The first step in hair coloring involves using a bleaching agent to oxidize natural hair pigments  
(b) The first step in the curling of hair involves the treatment of hair with a reducing agent  
(c) One of the major developments in the field of hair coloring includes the availability of a large variety of colors  
 (d) All of the answers apply

81. The attractive forces between water molecules are called:  
 (a) Intermolecular attractive forces  
(b) Nonmolecular repulsive forces  
(c) Intramolecular attractive forces  
(d) None of the answers apply
82. Certain steroids are used as anti-inflammatory drugs because these drugs are:  
(a) Potent steroids  
 (b) Capable of suppressing the inflammatory responses of the immune system  
(c) Antidepressants  
(d) Radioactive
83. The correct answer (expressed in scientific notation) for the calculation,  $6.6 \text{ g} + 1.23 \text{ g} + 1.29 \text{ g}$  is:  
(a) 9.1 g  
(b)  $9.12 \times 10^0 \text{ g}$   
(c) 91.2/10 g  
 (d)  $9.1 \times 10^0 \text{ g}$
84. The compound with the formula  $\text{CH}_3\text{CH}_2\text{OCH}_3$  is an ether.  
 (a) True  
(b) False  

85. Recent efforts in the fight against AIDS have been directed towards the development of:  
 (a) Viral entry inhibitors  
(b) More potent antibiotics  
(c) New SSRIs  
(d) None of the answers apply
86. In creating perfumes, the ingredients are blended based upon:  
(a) Price  
 (b) Molecular size and volatility  
(c) Taste  
(d) Color
87. Risk characterization integrates the exposure and effects components to estimate the risk.  
 (a) True  
(b) False

88. In order to achieve a high SPF, sunscreen formulations contain a combination of inorganic and organic ingredients.
- (a) True
  - (b) False
89. A neutral atom has a mass number of 27. The atom loses 3 electrons to form the cation containing 10 electrons. The neutral atom represents an atom of:
- (a) Al
  - (b) Si
  - (c) Ne
  - (d) Cl
90. Chemicals causing malformations in newborns are classified as:
- (a) Asphyxiants
  - (b) Carcinogens
  - (c) Irritants
  - (d) None of the answers apply
91. An anionic surfactant is:
- (a) Negatively charged
  - (b) Positively charged
  - (c) Without a charge
  - (d) None of the answers apply
92. The pH value for an aqueous solution of nitric acid should be:
- (a) Higher than 7.0
  - (b) Equal to 7.0
  - (c) Equal to 11.5
  - (d) None of the answers apply
93. The presence of hydrogen bonds in water accounts for its exceptionally high specific heat.
- (a) True
  - (b) False
94. Ethanol (a polar covalent compound) dissolves in water by the formation of:
- (a) Covalent bond
  - (b) Ionic bond
  - (c) Oxygen bond
  - (d) Hydrogen bond

95. Carbon-carbon triple bond in organic compounds is formed by the sharing of:
- (a) One pair of electrons
  - (b) Two pairs of electrons
  - (c) Loss and gain of electrons
  - (d) None of the answers apply
96.  $\text{SO}_x$  are generated during:
- (a) Smelting of mineral ores
  - (b) Pulp and paper production
  - (c) Combustion of fossil fuels
  - (d) All of the answers apply
97. Which of the following statements is true?
- (a) Oxygen is a greenhouse gas
  - (b) The pH value for an acidic solution should be 9.5
  - (c) The solubility of lead at a pH of 9.5 is higher than at a pH of 2.0
  - (d) Nuclear energy is an example of a non-fossil energy source
98. Laundry detergents are formulated by mixing many ingredients in order to:
- (a) Make them colorful
  - (b) Making them more water soluble
  - (c) Perform diverse functions
  - (d) Charge higher price
99. Alpha hydroxy acids:
- (a) Break down and lift off part of the top layer of dead skin cells
  - (b) Accelerate growth of living cells
  - (c) Are classified as cosmeceuticals
  - (d) All of the answers apply
100. What are the coefficients for the reactants and the products when the equation for the reaction:
- $$\text{Al}(\text{OH})_3 (\text{s}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow \text{Al}_2(\text{SO}_4)_3 (\text{aq}) + \text{H}_2\text{O} (\ell)$$
- Is balanced?
- (a) 4, 6, 2, 12 ✓
  - (b) 2, 6, 1, 6 ✓
  - (c) 2, 3, 1, 6 ✓
  - (d) None of the answers apply